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REPORT OF COMMITTEE ON REVISION OF STANDARD
SPECIFICATIONS FOR CAST IRON PIPE
AND SPECIAL CASTINGS¹

Your Committee is not able to recommend at the present time any definite revision of existing specifications, but progress toward this ultimate goal has been made.

As stated in last year's report, the important questions in the work of revision are those in reference to uniform outside diameter, chemical specifications, the requirements of a definite relation between breaking load and flexure, and the development of a better standard of coating.

No final decision as to the uniform outside diameter has been reached. The users, as indicated by the canvas of last year, are about equally divided for and against this change in the present specifications. The manufacturers have always been opposed, but, if—as now seems probable—the centrifugal method of casting pipe should prove a commercial success, a uniform outside diameter will necessarily be adopted for pipe so cast, and the manufacturers using this process will see, undoubtedly, the problem in a new light.

On the question of specifying the chemical quality of the metal and a definite relation between breaking load and flexure, the outstanding event of the year was the submission to the Committee of the report of Dr. Richard Moldenke, who had been employed by the manufacturers to make an extensive investigation. This investigation involved the casting of some 800 test bars at eight different foundries—one-half of which were cast according to the present water works standard 1 inch by 2 inch flat bar, and the other half according to the A. S. T. M. standard $1\frac{1}{4}$ inch circular "arbitration" bar. All bars were broken transversely and in the case of the round bars one or more of those showing a transverse strength nearest to the average transverse strength were taken for complete chemical analyses and tensile test. The report is a very voluminous and valuable document and, with the permission of the manufacturers, portions of it might well be published in the Journal of the Association.

¹Presented before the Philadelphia Convention, May 17, 1922.

As to the feasibility of a specification for chemical quality of the metal, Dr. Moldenke finds strongly in the negative, except in the case of sulphur for which he suggests a maximum limit of 0.12 per cent in lieu of the 0.10 per cent recommended by the Committee in the tentative revision issued several years ago. His reasons for opposing the specification of chemical quality is that no constituent has an effect which is not dependent upon the amount of other constituents, that the analysis of a test bar may be quite different from the analysis of the same metal when cast in the pipe, and that the final value of the metal is dependent on many other conditions than are disclosed by chemical analyses of a sample taken from the ladle.

Your Committee has reached no conclusion in reference to the adoption of specifications of chemical qualities. We are impressed by Dr. Moldenke's argument and also by the expense and time required to make analyses as a day by day part of the work of inspection, and it is not improbable that the final decision will be that such specifications, with the exception of sulphur, are impracticable. It is of interest, however, to note that by a very slight widening of the limits set by the chemical specification included in the tentative revision of the Committee, all the bars analyzed by Dr. Moldenke would pass and that, on the other hand, practically all the freak irons which have been found by Mr. McInnes in pipe, which have been broken in use and which he is to describe to this Convention, have analyses which would have thrown them into the discard, if subject to the chemical specifications suggested by the Committee.

In reference to the specification of a relation between breaking load and flexure in test bars the manufacturers have accepted the principle involved as sound and a reasonable means of checking the possible development of strength at the expense of resiliency.

At the first conference with the manufacturers in January it was agreed that the Chairmen of the New England and American Committees should prepare a tentative draft of a revised test bar specification. As submitted to the manufacturers, this draft called for a transverse breaking load of not less than 1900 pounds, a deflection for bars breaking at 1900 pounds of not less than 0.30 inch, and for bars breaking at higher loads a deflection of 0.30 inch plus 0.025 inch for each 200 pounds of load in excess of 1900 pounds. When this specification was applied by Dr. Moldenke to the bars broken by him, it was found that a large percentage would be rejected. As these bars were fairly representative of present practice, this result

at once raised questions as to whether a more resilient iron is necessary and as to whether such an iron can be economically produced.

At a meeting with the Foundrymen's Test Bar Committee on April 15th, your Committee took the position that the revised specification should lead to the development of the best metal which is economically possible and should not be framed on the assumption that the present irons are as good as can be produced at reasonable cost. It was admitted that the percentage of scrap used—owing to high freight rates and war residues—is now and will be for years to come abnormally high, and while the manufacturers insist that they are making as good pipe as at any time in the history of the industry, it was the judgment of the Committee that a further investigation should be undertaken to determine whether a better material than that tested by Dr. Moldenke is economically possible. Accordingly the manufacturers generously undertook to finance further work by Dr. Moldenke and he, in coöperation with Mr. Conard of the Joint Committee, was authorized to determine by actual variation of the mixture of pig iron and scrap, at one or more foundries, whether an iron which will more nearly meet the tentative specifications for relation between breaking load and flexure can be economically produced. This work is already begun and it is hoped that the report will be available before the end of the year. The Committee at the present time is unable, therefore, to specify definite figures for a relation between breaking load and flexure.

Obviously, the thanks of the Association are due the manufacturers for their coöperation in the work of the Committee as, in the absence of any appropriation, the Committee can only make progress as it obtains the assistance of the producers.

One of the interesting recommendations of the Moldenke report is that a new test bar, 20 inches long, circular in section, with a diameter of $1\frac{3}{8}$ inches, to be broken between supports 18 inches apart, should be adopted instead of the present water works standard 1 inch by 2 inch flat bar which is broken between supports 24 inches apart. The Committee is not convinced that the circular bar is an improvement, but it has subscribed to Dr. Moldenke's recommendation to the manufacturers that parallel tests on the present and suggested type of bars should be carried on for six months.

In the problem of developing an improved coating no definite progress has been made during the year, and, in the absence of any available funds there appears to be little prospect of being able to undertake experimental work.

Present methods of coating pipe have small regard for the present specifications. The material used is generally crude coal tar, or inferior water gas tar and not a "pitch"—as required by the specifications, except so far as the crude tar is refined to a pitch by the distillation which takes place in the dipping tank. Temperatures are not accurately controlled and overheating, particularly in the case of heavy pipe, is responsible for thin brittle coatings of little value as a protection to the metal.

The manufacturers will furnish just as good a coating as the users of pipe demand, and it is the present feeling of the Committee that the most direct road to the development of a better standard is for those engineers and superintendents, who appreciate the economy of maintaining the carrying capacity of pipe lines, to adopt a specification which will guarantee the use of a straight run coal tar pitch and such control of the heating of the pipe and bath as will prevent injury to this material in its application to the pipe. The tentative specifications for tar issued by your Committee in 1916 will insure the use of coal tar pitch.

Your Committee believes that, in view of the possible fundamental effects of certain new processes of making pipe on the problem of standardization, it is perhaps fortunate that we have made progress slowly in reaching any definite revision of existing specifications.

This report is unanimously approved by the Committee.

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